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This extension of an earlier study investigated the hypothesis that occupational choices follow orderly or lawful patterns and can be predicted from initial choices. By applying Holland's scheme of classification to students' successive occupational choices, the authors learned that the classification provides a practical definition of occupational relatedness. They found that the use of a 3-digit Vocational Preference Inventory (VPI) code and of this definition of relatedness resulted in improved predictions over those made using only the highest VPI scale. Occupational change "maps" are presented to assist understanding of the concepts and findings. In addition, the efficiency of Holland's classification scheme was compared with a related one by Roe (1966). For prediction purposes either scheme is better than none, but more comparative tests with different populations for several purposes are needed to establish their usefulness and relative value. (Author/HH)

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CHANGES IN THE VOCATIONAL PLANS OF COLLEGE STUDENTS: ORDERLY OR RANDOM?

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Summary

This extension of an earlier study investigated the hypothesis that occupational choices follow orderly or lawful patterns and can be predicted from initial choices. By applying Holland's classification scheme to students' successive occupational choices, we learned that the classification provides a practical definition of occupational relatedness. We found that the use of a three-digit Vocational Preference Inventory (VPI) code and this definition of relatedness resulted in improved predictions over those made using only the highest VPI scale. Occupational change "maps" are presented to assist in the understanding of the concepts and findings.

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Changes in the Vocational Plans of College Students: Orderly or Random?

John L. Holland and Douglas R. Whitney

American College Testing Program

Nearly everyone--parents, counselors, researchers, and educators--believes that the vocational ambitions of college students are both unstable and disorderly; that is, students often change their minds, and their successive occupational choices frequently appear unrelated. Perhaps the chief outcome of these beliefs, at least for researchers, has been the search for more stable characteristics of the student which could be used to forecast his occupational future. Researchers and their sponsors have invested heavily in the development of better interest inventories, and in the development of predictive methods that use large and diverse amounts of student information--notably the discriminate function and the multiple regression techniques.

The present study attempts to interpret and predict a student's successive occupational choices by still another method--the use of a classification scheme and its closely associated theory. Holland's psychological classification scheme (Holland, 1966b) was applied to the successive occupational choices of college students to learn if student changes in occupational choice are orderly or interpretable in terms of a theory of personality types, and if a classification scheme so organizes a student's occupational choices that efficient predictions become possible.

Method

Student Sample

The data for the present study came from American College Surveys described earlier by Richards, Holland, and Lutz (1967). College freshmen were twice polled for their vocational aspirations, the second instance following the first about 8 or 12 months later.

Students came from two college samples. The freshmen in the fall sample of six colleges were polled in September of 1964 and in May of 1965--an 8-month interval. The spring sample of college freshmen were polled in May of 1964 and again in May of 1965, when they were sophomores--a 12-month interval. The spring sample included 28 colleges. Both samples contained students with a great range of scholastic potential, vocational interests, and socioeconomic status. Table 1 shows the samples of colleges and students.

Classification Scheme

For all the following analyses, student vocational choices were categorized according to the classification scheme developed earlier: six categories for men--Realistic, Intellectual, Social, Conventional, Enterprising, and Artistic--and seven categories for women--Intellectual, Social-Intellectual, Social-Conventional, Social-Enterprising, Social-Artistic, Conventional, and Artistic (Holland, 1966b). Tables 2 and 3 indicate the assignment of vocational choices to vocational classes for men and women. Students selected their career choices from a coded list of 99 careers. Since all classifications were performed by a computer, we assumed that they were performed with perfect reliability.

Table 1

The Samples of Students and Colleges

College	Male	Female
Spring Sample		
University of Alabama	186	201
Arkansas Polytechnic College	72	52
California State College at Hayward	62	74
Colorado State College	31	107
Southern Connecticut State College	89	273
Wesleyan University (Connecticut)	86	--
Bloom Township Community College (Illinois)	38	20
Lyons Township Junior College (Illinois)	29	32
Southern Illinois University	48	29
Indiana State University	126	164
Burlington Community College (Iowa)	79	31
Kansas State University	322	216
University of Kentucky	139	154
Westbrook Junior College (Maine)	--	103
William Jewell College (Missouri)	74	66
Plymouth State College (New Hampshire)	38	86
Glassboro State College (New Jersey)	121	393
New Mexico State University	52	19
Jamestown Community College (New York)	21	43
University of North Dakota	89	123
Southeastern State College (Oklahoma)	97	61
Mount Mercy College (Pennsylvania)	--	104
Swarthmore College (Pennsylvania)	54	46
Black Hills State College (South Dakota)	60	38
University of Tennessee	205	184
Baylor University (Texas)	64	101
Snow College (Utah)	18	31
Fairmont State College (West Virginia)	93	85
Total	2293	2836
Fall Sample		
California State College at Hayward	69	102
Chico State College (California)	109	173
Amherst College (Massachusetts)	238	--
University of Massachusetts	759	875
Baldwin-Wallace College (Ohio)	221	265
Cuyahoga Community College(Ohio)	180	156
Total	1576	1571

Table 2

A Psychological Classification Scheme for Vocations
(Men)

Vocation	VPI Code
Realistic class	
Industrial arts educ	RIS
Trade & industrial educ	RIS
Forestry	RIS
Civil engineering	RIE
Farming	RIE
Mechanical engineering	RIE
Industrial engineering	RIE
Architecture	RIA
Geography	RISE
Agricultural science	REI
Intellectual class	
Oceanography	IRS
Veterinary science	IRS
Biochemistry	IRS
Botany	IRS
Zoology	IRS
Aeronautical engineering	IRE
Chemical engineering	IRE
Electrical engineering	IRE
Engineering, general & other	IRE
Military service	IRE
Geology, geophysics	IRA
Astronomy, astrophysics	IRA
Chemistry	IRA
Physics	IRA
Engineering science	IRA
Mathematics, statistics	IRC
Metallurgical engineer	IRCE
Medical technology	IRSA
Other biological sci field	ISR
Intellectual class (con't.)	
Biology	ISR
Natural science educ	ISR
Mathematics educ	ISR
Other health fields	ISA
Medicine	ISA
Dentistry	IER
Pharmacy	IES
Physiology	IES
Physical therapy	IAS
Anthropology	IAS
Social class	
Physical educ, recreation & health	SRI
Educ of exceptional children	SRI
Elementary education	SIE
Experimental & general psychology	SIE
Social work	SIE
History education	SEI
Educational psychology	SEI
History	SEI
Education, general & other specialties	SEA
Counseling & guidance	SEA
Industrial & personnel psychology	SEA
Foreign service	SEA
Sociology	SEIA

Table 2 (con't.)

Vocation	VPI Code
Social class (con't.)	
General social sciences	SAI
Theology, religion	SAI
Clinical psychology	SAI
Foreign language educ	SAE
Conventional class	
Business education	CSE
Accounting	CER
Finance	CEI
Enterprising class	
Public administration	ESC
Political science	ESA
Purchasing	ECR
Sales	ECR
Economics	ECI
Other business & commercial	ECI
Management	ECS
Marketing	ECS
Law	EAS
Public relations	EAC
Artistic class	
Literature	AIS
Art	AIS
Speech	ASI
General humanities	ASI
Philosophy	ASI
English, creative writ	ASI
Art education	ASI
Music education	ASI
Artistic class (con't)	
Music	ASE
Drama	ASE
English education	ASE
Journalism, radio-tv, communication	AES
Other fine & applied art	A<u>EI</u>

Note. Underlining indicates tied average VPI scale scores.

Table 3

A Psychological Classification Scheme for Vocations
(Women)

Vocation	VPI Code
Realistic class	
None	
Intellectual class	
Mathematics, statistics	ISC
Medicine	ISA
Veterinary medicine	ISA
Other biological science	ISA
Biology	ISA
Bio-chemistry	ISA
Zoology	ISA
Natural science educ	ISA
Chemistry	ISA
Physics	IAR
Agricultural science	IAS
Architecture	IAS
Social class	
Pharmacy	SIA
Medical technology	SIA
Mathematics education	SIA
Clerical work, office	SCE
Business education	SCE
Secretarial science	SCA
Management, business administration	SEA
Sales	SEA
Purchasing	SEA
Educational psychology	SEA
Dentistry	SAI
Nursing	SAI
Other health fields	SAI
Clinical psychology	SAI
Experimental & general psychology	SAI
Social class (con't.)	
Political sci, gov't, international relations	SAI
Theology, religion	SAI
Physical therapy	SAI
Speech	SAE
Elementary education	SAE
Foreign language educ	SAE
English education	SAE
Educ, general & other specialties	SAE
History education	SAE
Physical educ, recreation & health	SAE
Education of exceptional children	SAE
Home economics educ	SAE
Counseling & guidance	SAE
Sociology	SAE
History	SAE
Public relations, advertising	SAE
Law	SAE
Social work, group work	SAE
Home economics	SAE
Housewife	SAE
Conventional class	
Accounting	CSE
Enterprising class	
None	
Artistic class	
Art	ASI
Art education	ASI
Literature	ASI
English, creative writ	ASI
Music	ASI

Table 3 (con't.)

Vocation	VPI Code
Artistic class (con't.)	
Music education	ASE
Drama	ASE
Other fine & applied arts	ASE
Modern foreign language	ASE
Journalism, radio-tv, communication	ASE
Foreign service	ASE
Library sci, archival science	ASE

If we classify people by similar vocational choices, we are also classifying similar personalities. Accordingly, the present schemes arrange vocations in terms of personality types and subtypes.

The instrument used in developing the classification was the Vocational Preference Inventory (VPI) (Holland, 1967). Using this inventory provided a psychological rationale for the interpretation of the classification, as the scales assess the major constructs in a theory of vocational choice and personality (Holland, 1966a). Both the inventory and the theory have undergone investigation so that the meanings attributed to scale scores and, consequently, the present classification scheme have some validity (Holland, 1962, 1963, 1964, 1967).

To apply the logical principles for classification, we used the average interest inventory profiles of students aspiring to specific

vocations. To illustrate, the profile formed by the Realistic, Intellectual, Social, Conventional, Enterprising, and Artistic scales of the VPI for a sample of prospective physicists defined both the major class to which physicists belonged (the scale with the highest mean score), and the various subclasses to which physicists belonged (the scales with the second and third highest mean scores). Such a procedure results in groups and subgroups with an increasing degree of homogeneity as we proceed from one to three average scale scores as a basis for the formation of classes and subclasses. Consequently, we were able to interpret the application of the classification to a problem with more reliability and validity than we might have otherwise.

This simple procedure, then, complies with the rules for logical classification: All vocations are classified into one of six major classes; each vocation is classified only in a single subclass. The principle for classification is always the same empirical procedure--the use of average scores for six interest scales.

In the following analyses, the men in the fall and spring samples were combined; likewise, the women in both samples were combined. Although these additions are not cricket because the samples are not comparable in every respect (including a difference in time intervals between surveys), combining the samples to increase the stability of the findings seemed more desirable than separate analyses with only one-half as many students. Needless to say, this study requires repetition by other investigators using extremely large student groups and longer time intervals.

Results

The first step was the construction of separate tables for men and women to show how a student's first occupational choice was related to his second choice 8 or 12 months later. These large tables (84 by 84 occupations for men and 62 by 62 for women) are not shown. All of the remaining analyses or tables were, however, obtained by extracting, summarizing, or rearranging the information in these original tables.

Tables 4 and 5 for men and women are summaries of the relationships found between a student's first and second occupational choices. The occupations in the margins of these tables are arranged according to the classification scheme developed earlier. Note that each major group or class usually has several subgroups. The numbers in the diagonal are the number of students whose first and second occupational choices belong to the same subgroup on both occasions. On the average, 50% of the men and 60% of the women selected the same occupation on both occasions. However, these averages conceal the great range of differences in stability among occupational choices. For men whose initial choice was theology (N = 37), 78% also selected it 8 or 12 months later. In contrast, engineering science (N = 26) is preferred both times by only 12% of its initial aspirants. Individual occupations show a similar variation for women. Elementary education (N = 1,154) is preferred both times by 83% of the women choosing it initially, but biology (N = 29) is preferred by only 14% of its initial aspirants. The meaning of this

variation in stability from one occupational choice to the next is unclear. To some extent, stability goes with the popularity of an occupational choice. At the same time, higher stability appears to be associated with those occupations considered to be most appropriate for each sex; that is, feminine occupations for women and masculine occupations for men appear to have more stability among aspirants. But there are many exceptions to both of these observations.

By studying one occupational subgroup at a time, the reader can see how students who start college in a special subgroup fan out to related and unrelated subgroups after 8 or 12 months of college. For instance, the IREs in Table 4 include students whose first choices are classified as Intellectual-Realistic-Enterprising occupations--military science, aeronautical, chemical, electrical, and general engineering. The original group of IREs was composed of 362 students. Table 4 shows that 213 of the 362 IREs gave the same vocational preference or one of the other 4 possible choices in the same subgroup (IRE) 8 or 12 months later. The other numbers in the IRE row reveal the new choices. They are: 49 RIEs (farming, civil, mechanical, and industrial engineering), 15 IRAs (chemistry, physics, geology, astronomy, geophysics, astrophysics, and engineering science), and smaller numbers of students with other alternatives.

To facilitate the interpretation of Tables 4 and 5, we prepared diagrams for the popular, initial vocational choices to illustrate the typical choices made when students change from their initial to other

Table 4

The Relation of a College Student's First Vocational Choice to His Vocational Choice 8-12 Months Later (Men)

1st VC	Second Vocational Choice																					
	RIS	RIE	REI	IRS	IRE	IRA	ISR	ISA	IER	SRI	SIE	SEI	SEA	SAI	CER	ESA	ECR	ECS	EAS	ASI	ASE	AES
RIS	63	5	3	3	2		2				1	1	3	1				3	1			
RIE	2	179	11	2	22	3	4		1	2	1	2	1	3	2	2	2	13	1			
REI		11	29	1			1			1			3				1	3				
IRS	4	2	5	72	1	3	15	3		3	1	2	2			2				1	1	
IRE	6	49	2		213	15	6	6	4			4	1	2	5	4		10	2	1	2	3
IRA	1	9	1	6	17	91	7	4	1	2	1	1			2	1	2	2	5	1		
ISR	6	4	1	9	5	8	103	7	3	9	9	3	2		5			4	1	2	2	
ISA	1			2	4	4	4	177	3	1	2	2	5	9	2	3	1	4	4	3	2	1
IER	1		1	1		2	2	4	51			2		1	2	1	1	8	1			
SRI	3				1		4		1	87	1	2	3	1				5	1	1	1	
SIE		1	1	1	1			1		9	52	5	10	4				4	3	2	1	
SEI				1	4					6	13	99	10	2	1	3	3	2	4	1	2	
SEA	1		1							1	5	3	22	4		5		1	7		1	
SAI					1					1	3	1	2	37			1	1		3		2
CER		1			2							2	2	1	73		3	18	4	1		
ESA	1	2			1				1		2	4	7	1	1	24	1	3	12		1	1
ECR	1	1			2							1			1		13	12		2		
ECS	6	1	1		2	1	1	1		1		4	1	2	10		21	102	7			2
EAS					5			3				5	4	1	3	7	2	6	109	2		2
ASI	1		1		2			1		3		2		3		1			2	44	17	4
ASE			1				1			2	6	2	4	2					1	6	35	
AES					1								2					1	1	3	1	21

Note. --Students who were "undecided" (N = 545), gave unclassifiable responses (N = 152), or subgroups with Ns less than 50 (N = 454) were omitted to reduce the size of this table.

Table 5

The Relation of a College Student's First Vocational Choice to His Vocational Choice 8-12 Months Later (Women)

1st VC	Second Vocational Choice															
	ISC	ISA	IAR	IAS	SIA	SCE	SCA	SEA	SAI	SAE	CSE	ASI	ASE	UNC	?	N
ISC	28	1			14		1	2	1	5	2		1		9	64
ISA	4	109			14	1	2	3	24	52		8	5	3	11	236
IAR	1		4													5
IAS				5			1				1	2	2	2		13
SIA	10	18			121	4	2	1	8	50	1	2	1	6	3	227
SCE						46	20			10	2			1		79
SCA						18	79		2	11	1	2		3	7	123
SEA					1	3	1	28	2	27	1		1	2	4	70
SAI	1	2			6	3	8	3	258	73	1	3	14	2	12	386
SAE	2	13			8	4	17	33	41	2036	4	29	54	27	89	2357
CSE		2	1			4		1		4	15					27
ASI		1				2	3	2	2	30		107	22	7	15	191
ASE		3			1	1	1		6	47		13	107	7	19	205
UNC		2			2	1	2	1	2	25		3	2	17	5	62
?	3	6			8	5	5	4	21	75	2	7	15	13	52	216
N	49	157	5	5	175	92	142	78	367	2445	30	176	224	90	226	4261

Note. -- "UNC" = unclassifiable response; "?" = undecided.

occupational choices. Examining the tables in the appendix will provide a vivid account of patterns of change in occupational preferences.

In general, Tables 4 and 5 strongly suggest that students tend to remain in the same major occupational class even if they change their preference. And if students move to another major class, they prefer a related major class. For instance, male students with Realistic choices, if they change, change most frequently to Intellectual choices; Intellectual choices frequently become Realistic choices; Social choices become Enterprising choices, etc. In addition, some kinds of changes are rare or do not occur at all. For example, male students with initial Artistic choices never select a Conventional occupation as a second choice; students with Social choices rarely select Conventional or Realistic choices, etc.

To examine whether or not a student's vocational choices are related and to what degree they are related, special summary Tables 6 and 7 were prepared for men and women. These tables were prepared by reorganizing and summarizing the information in the original summary tables.

The results for men in Table 6 show that 50% select the same occupation on both occasions, 4% select an occupation in the same subgroup, 6% select an occupation in a closely related subgroup, and 9% select a remotely related occupation in the same major class. Altogether, about 69% of the men's successive choices are in the same major class. Another 10% have second choices belonging to a "closely

Table 6

Lawfulness of a College Student's
Successive Vocational Choices (Men)

1st VC	Second Vocational Choice									
	Same major class				Related Maj class		Unrelated Maj class	Unc	Und	N
	SO	SSG	CR	R	cr	r	U			
RIS	58	5	5	3	5	3	11	2	8	100
RIE	161	18	7	11	33	6	30	6	21	293
RIA	22	*	6	0	4	1	3	0	2	38
RISE	0	*	0	0	0	1	1	0	2	4
REI	29	*	0	12	*	5	7	5	3	61
IRS	67	5	6	20	6	5	12	1	11	133
IRE	188	25	17	16	59	2	36	4	15	362
IRA	83	8	27	12	11	1	22	7	15	186
IRC+										
IRCE	39	0	11	10	2	0	15	0	11	88
IRSA	3	0	1	1	0	0	2	0	1	8
ISR	89	14	7	37	9	14	34	7	28	239
ISA	176	1	4	16	2	18	24	2	18	261
IER	51	*	1	9	*	11	11	1	4	88
IES	10	0	0	6	*	4	3	0	1	24
IAS	3	0	0	0	0	0	5	0	1	9
SRI	87	0	0	7	*	4	19	1	6	124
SIE	50	2	0	31	1	2	14	2	7	109
SEI	77	22	10	22	5	9	16	4	21	186
SEA	19	3	3	12	5	8	6	3	6	65
SEIA	1	*	1	2	0	0	4	1	0	9
SAI	36	1	0	7	3	2	4	1	4	58
SAE	6	*	1	3	0	0	3	1	2	16
CSE	4	*	0	0	*	0	3	1	1	9
CER	73	*	6	1	24	6	12	1	11	134
CEI	17	*	1	0	11	7	2	0	3	41
ESC	2	*	3	4	2	1	0	2	1	15
ESA	24	*	2	18	11	3	10	0	12	80
ECR	10	3	13	0	2	1	7	1	2	39
ECI	6	2	10	2	3	0	7	0	4	34
ECS	90	12	27	11	11	0	24	5	21	201
EAS	109	*	3	21	2	2	21	0	10	168
EAC	2	*	1	4	0	0	4	0	4	15

Table 6 con't.

1st VC	SO	SSG	CR	R	cr	r	U	Unc	Und	N
AIS	14	1	0	3	0	1	4	1	2	26
ASI	43	1	17	7	4	6	10	2	5	95
ASE	34	1	6	0	2	15	4	2	8	72
AES	21	*	0	4	1	1	4	0	5	36
AEI	0	*	0	3	0	1	0	0	0	4
Total	1704	124	196	315	218	140	394	63	276	3430
%/N	50	4	6	9	6	4	11	2	8	100

*An impossible classification because no such combination is included in the current classification scheme. The addition of more occupations would remedy this defect.

Note. The headings in Table 6 are interpreted as follows: "SO" = students who prefer the same occupation in the first and second surveys. "SSG" = students whose vocational choices fall on both occasions in the same occupational subgroup such as ISA and ISA. "CR" = students whose choices belong to "closely related" subgroups in the same major occupational class; that is, a student's first and second choices belong to subgroups having the first two letters of their codes in common such as IAR and IAS. "R" = students whose occupational choices have the same initial letter code such as SIA and SEA. "cr" = students whose choices belong to closely related major occupational classes such as SIA and ISE. The first two letters of a student's coded occupational choices are simply reversed. "r" = all others whose initial letter code is the same as the related major class. Finally, "U" = students whose first and second vocational choices fail to meet any of the above criteria of "relatedness," and are classified as "unrelated. "Unc" = students whose second choices were unclassifable. "Und" = students whose second response was "undecided."

related" or "related" subgroup in a related major class. Put another way, 79% of the men indicate successive vocational choices that appear related or lawful rather than random. Finally, only 11% appear unrelated, and another 10% are unclassifiable or undecided upon the second survey. For explicit definitions of the categories used to assess the relatedness of a student's first and second choices, see the long footnote for Table 6.

The results for women in Table 7 parallel those for men. About 60% of the women select the same occupation on both occasions, 14% select an occupation in the same subgroup, 5% select an occupation in a closely related subgroup, and 5% select a remotely related occupation in the same major class. Altogether, 84% of the women's successive occupational choices belong to the same major occupational class. Another 9% selected "closely related" or "related" occupations in a related major group. And only 1% have clearly unrelated first and second choices.

As a last step, a separate analysis was made using only students who gave different choices on both occasions. By excluding the large proportions of men and women who did not change their vocational choices (50 and 60 percent), the classification was put to a more severe test. For each initial choice, an expected frequency for choosing the same major class or the related major class was calculated. These analyses using a sign test (not shown) revealed that the observed frequencies (same or related major class) exceeded the expected frequencies

Table 7

Lawfulness of a College Student's
Successive Vocational Choices (Women)

1st VC	Second Vocational Choice									
	Same major class				Related Maj class		Unrelated Maj class	Unc	Und	N
	SO	SSG	CR	R	cr	r	U			
ISC	28	*	1	0	14	9	3	0	9	64
ISA	81	28	4	0	14	82	13	3	11	236
IAR	4	*	0	1	*	0	0	0	0	5
IAS	5	0	0	0	*	4	2	2	0	13
SIA	121	0	*	65	28	0	4	6	3	227
SCE	41	5	20	10	2	*	0	1	0	79
SCA	79	*	18	13	1	*	2	3	7	123
SEA	20	8	*	34	*	*	2	2	4	70
SAI	240	18	73	20	17	*	4	2	12	386
SAE	1569	467	41	62	83	*	19	27	89	2357
CSE	15	*	*	*	4	5	3	0	0	27
ASI	89	18	22	*	32	7	1	7	15	191
ASE	94	13	13	*	53	3	3	7	19	205
Total	2386	557	192	205	248	110	56	60	169	3983
%/N	60	14	5	5	6	3	1	1	4	99

at a rate well beyond the chance level ($P < .000001$) for both sexes. We conclude then that the use of this classification increases our predictive efficiency beyond the level provided by simply assuming that the majority of students will maintain their initial vocational choice.

Discussion

Although the results are strong evidence for the idea that vocational choices of college students are both lawful and predictable, there is a need for much more research. Other investigators need to apply the classification scheme used here to other student groups for longer intervals of time--especially the period from freshman to senior year--to learn if the findings hold for longer periods of time. Because the results hinge on a particular classification with specific definitions of occupational "relatedness," they require critical scrutiny by others. The main classes may or may not be too broadly defined for practical value in vocational counseling. Similarly, the definitions of "occupational relatedness" may be too lenient to be helpful. These and other questions can only be resolved by trying out the classification to see how well it works for different purposes.

Despite these reservations, the findings appear congruent with several related studies. In three earlier longitudinal studies for one, two, and four-year intervals, Holland (1962, 1963, 1964) found that the majority of students gave occupational choices belonging to the same or related occupational class. In a recent longitudinal study of college students, Astin (in press) concludes that "patterns of change in career choice...are not random. In general, those students who change their plans tend to change to fields that are related to their initial choice." It should be pointed out, however, that Astin found less "relatedness" between a student's occupational choice as a freshman and as a senior

than we found in the present study. In a more remotely related study, Roe (1966) classified the job changes for a sample of 804 men and found that 68% remained in the same occupational class during their careers. Although Roe's classification differs from Holland's, Roe's results reinforce the hypothesis that the successive occupational choices of students and older adults are lawful and predictable. With skillful revisions of classification schemes and more work, a clear knowledge of a person's occupational ambitions and work history appears within our reach.

Assuming that other investigations reinforce the results, several practical applications appear plausible and desirable. Occupational maps, like Figures 1 and 2, but in greater detail, could be prepared to show students who wish to change fields some of the common alternatives taken by other students. Such maps might be especially useful because they would reduce the ambiguity and difficulty of the search for suitable alternatives. Occupational materials in counseling could also be arranged in terms of the present classification scheme and in terms of the popular student changes in occupational choice. Occupational maps could be used in freshmen orientation programs and in career orientation courses to provide a helpful understanding of the occupational world and to suggest alternatives closely related to a student's initial choice. Although such uses of this research are remote at present, they are promising for experimental programs and new studies.

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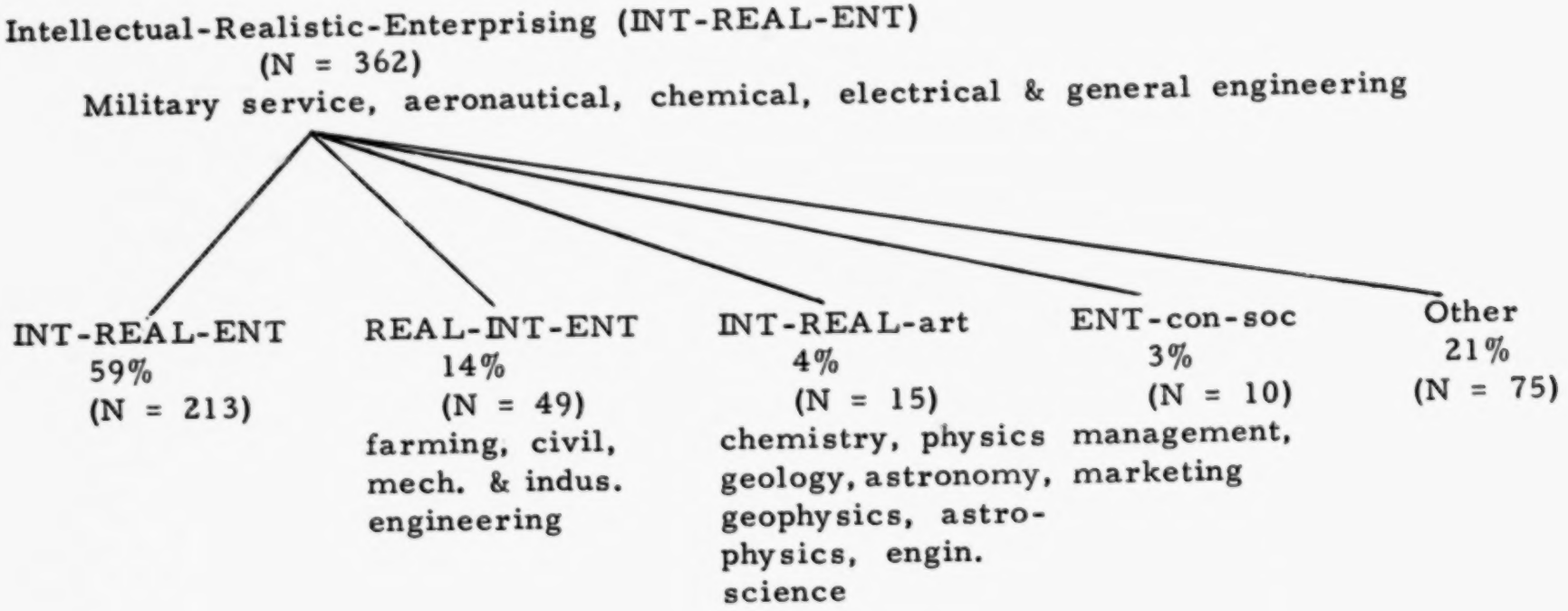
APPENDIX

Patterns of Occupational Change

In the following diagrams, the lines indicate how a student's initial occupational choice is followed by the same or related occupational choices about 8 to 12 months later.

1. Men


Intellectual-Realistic-Enterprising (INT-REAL-ENT)
(N = 362)
Military service, aeronautical, chemical, electrical & general engineering
INT-REAL-ENT
59%
(N = 213)
REAL-INT-ENT
14%
(N = 49)
farming, civil, mech. & indus. engineering
INT-REAL-art
4%
(N = 15)
chemistry, physics geology, astronomy, geophysics, astro-physics, engin. science
ENT-con-soc
3%
(N = 10)
management, marketing
Other
21%
(N = 75)

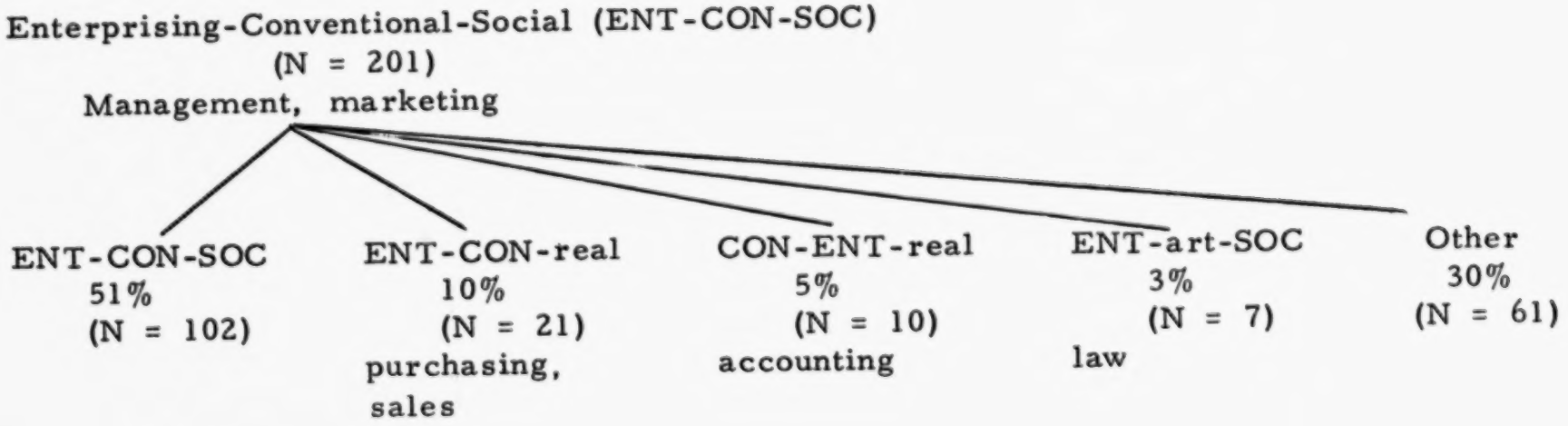
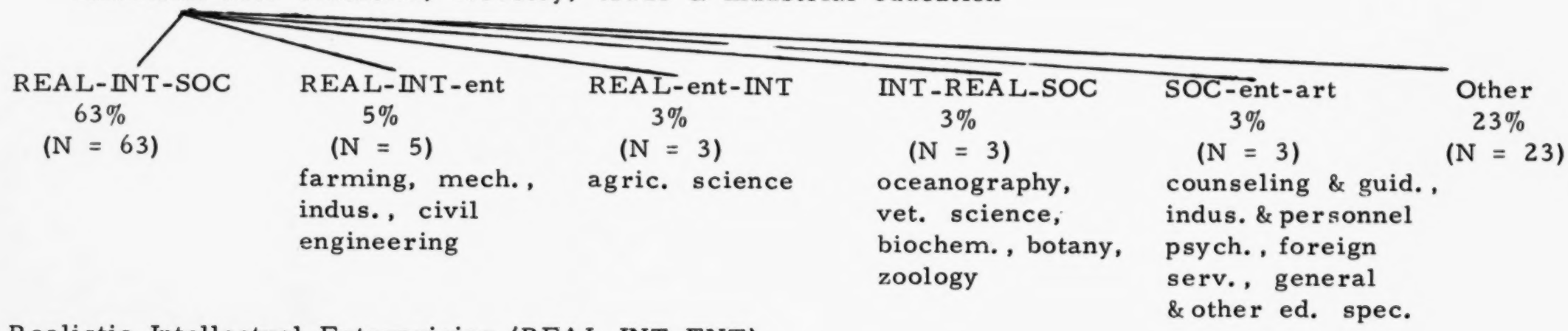
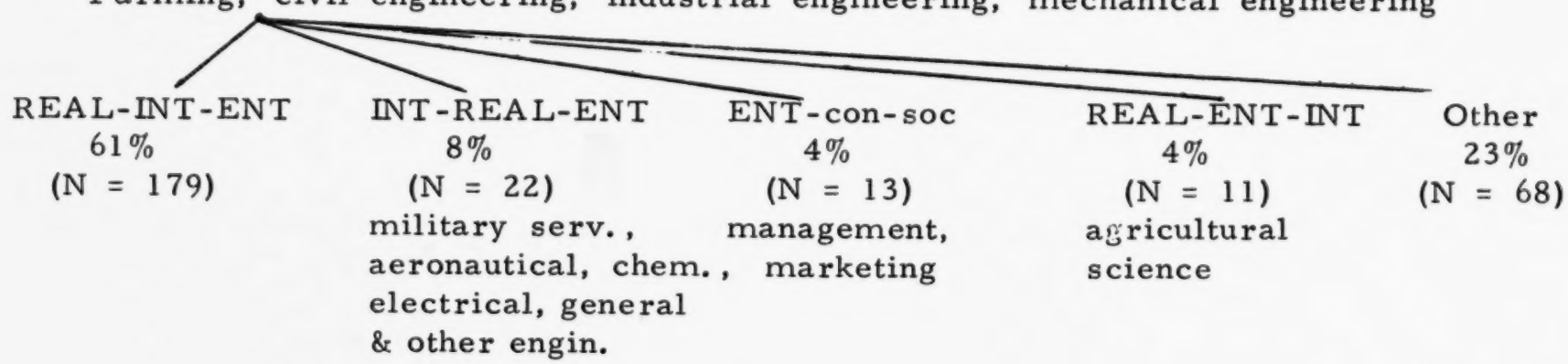

Enterprising-Conventional-Social (ENT-CON-SOC)
(N = 201)
Management, marketing
ENT-CON-SOC
51%
(N = 102)
ENT-CON-real
10%
(N = 21)
purchasing, sales
CON-ENT-real
5%
(N = 10)
accounting
ENT-art-SOC
3%
(N = 7)
law
Other
30%
(N = 61)

Figure 1 con't.

Realistic-Intellectual-Social (REAL-INT-SOC)
(N = 100)
Industrial arts education, forestry, trade & industrial education



Realistic-Intellectual-Enterprising (REAL-INT-ENT)
(N = 293)
Farming, civil engineering, industrial engineering, mechanical engineering



Intellectual-Realistic-Social (INT-REAL-SOC)
(N = 133)
Oceanography, veterinary science, botany, biochemistry, zoology

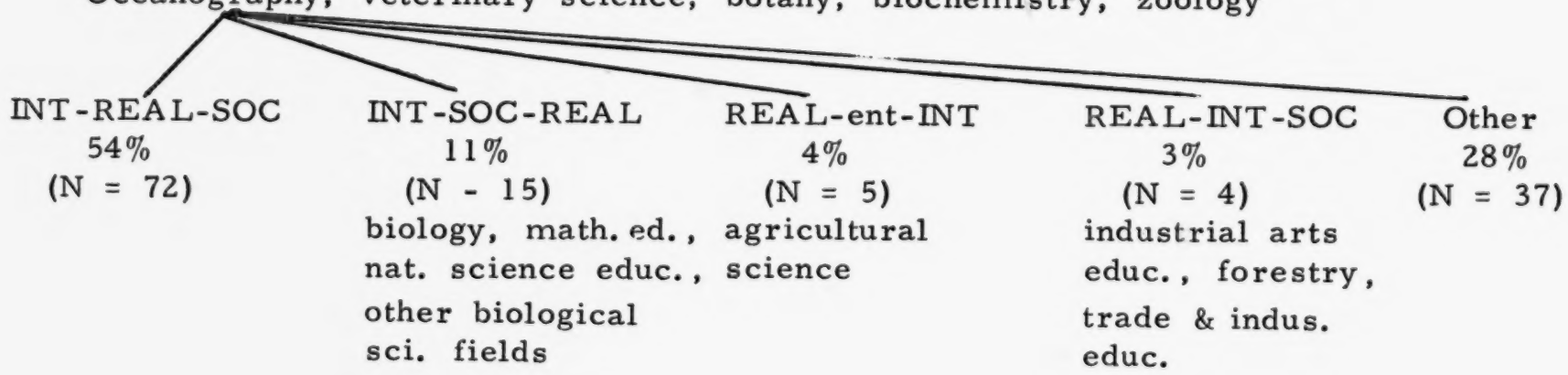
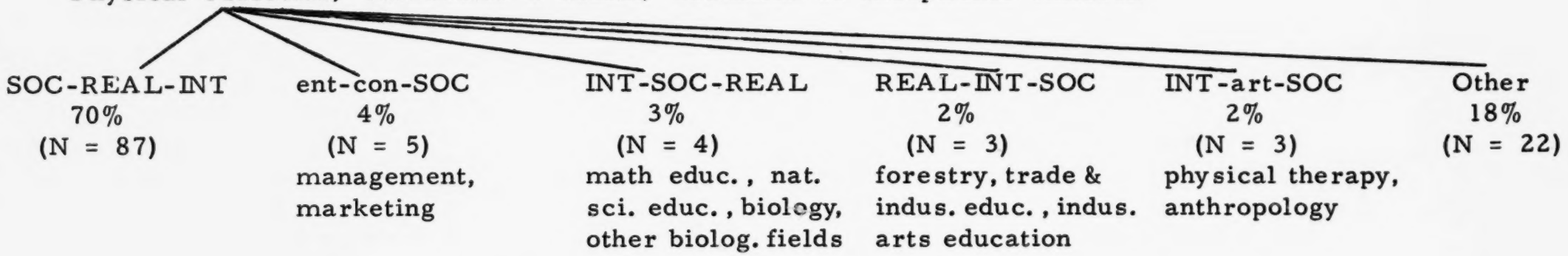
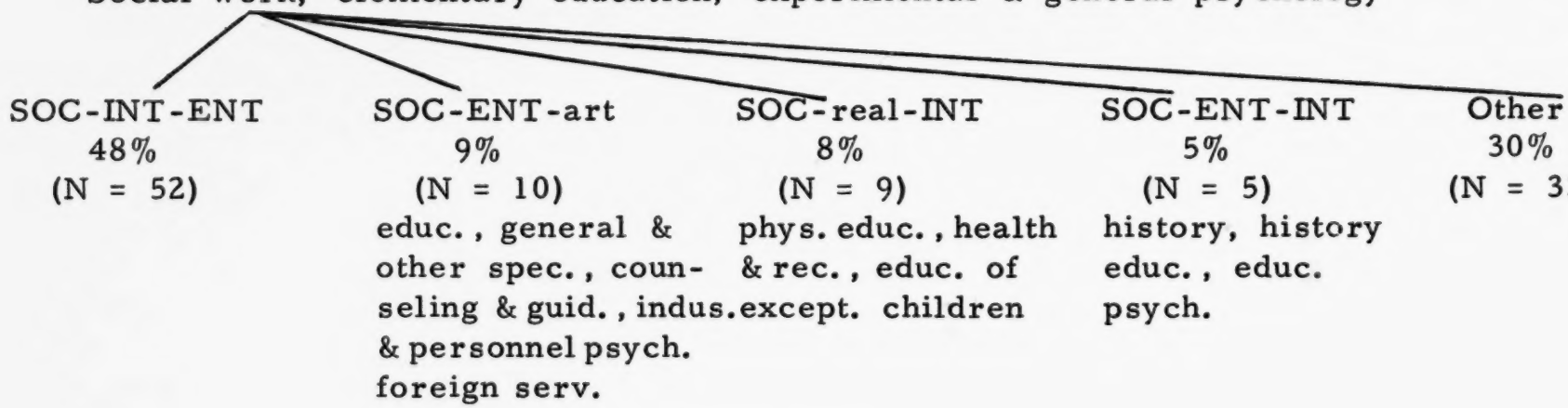


Figure 1 con't.

Social-Realistic-Intellectual (SOC-REAL-INT)
(N = 124)
Physical education, recreation & health, education of exceptional children



Social-Intellectual-Enterprising (SOC-INT-ENT)
(N = 109)
Social work, elementary education, experimental & general psychology



Social-Enterprising-Intellectual (SOC-ENT-INT)
(N = 186)
History, history education, education psychology

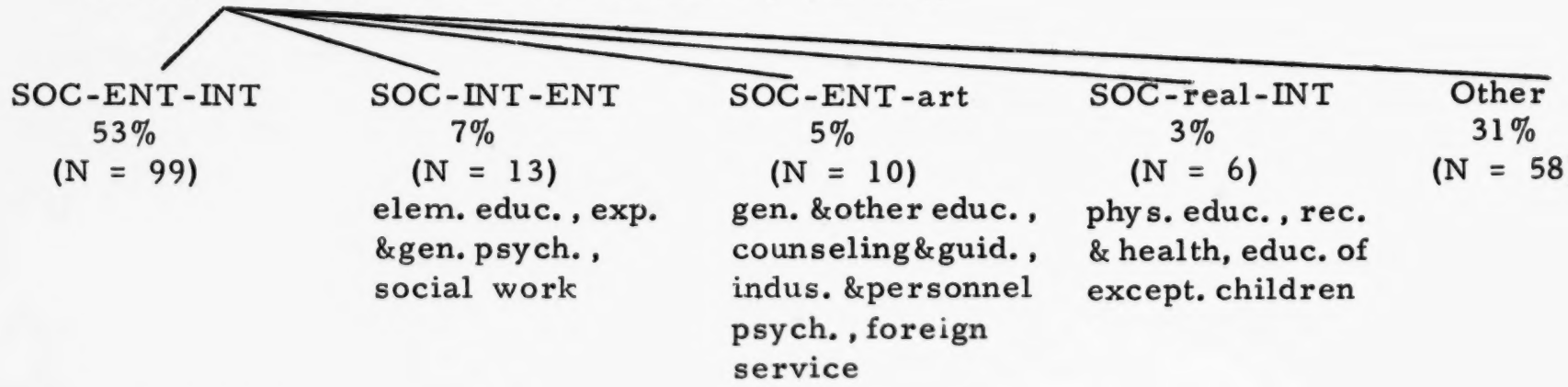
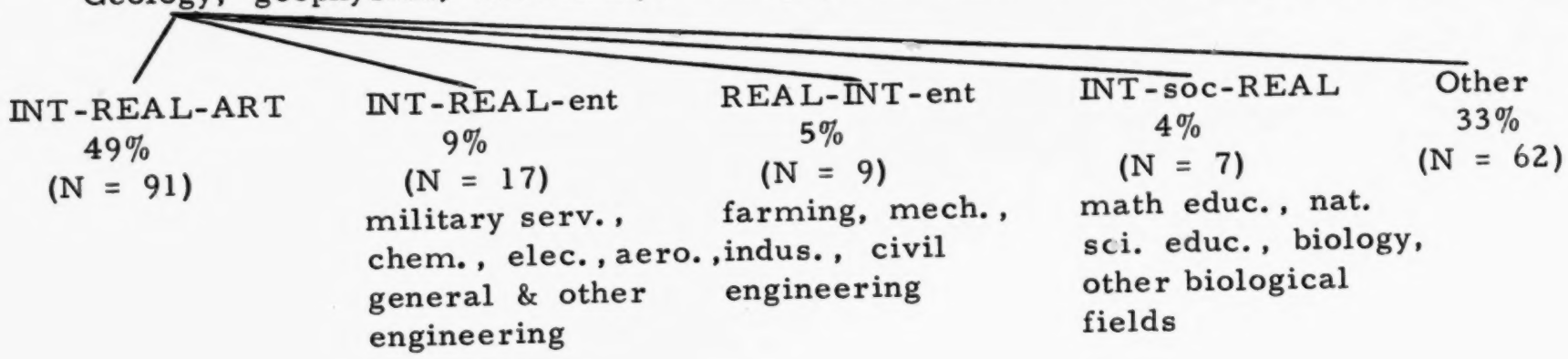
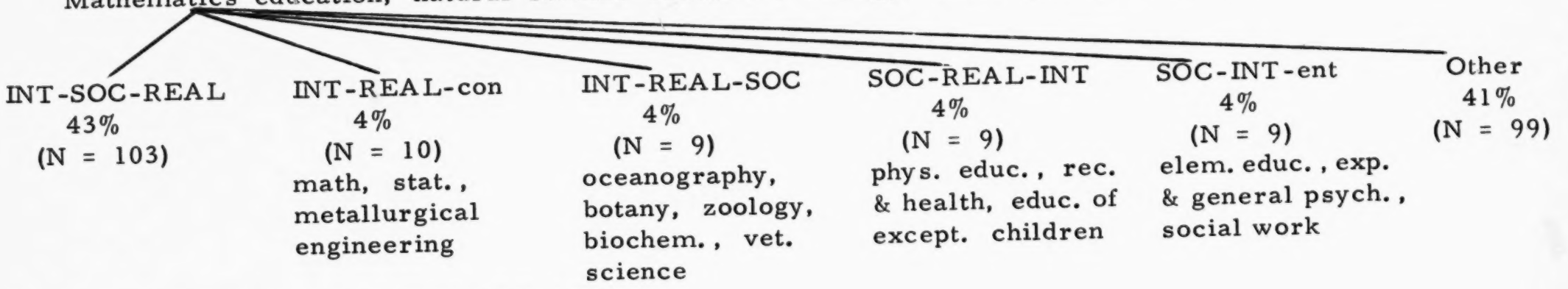


Figure 1 con't.

Intellectual-Realistic-Artistic (INT-REAL-ART)
(N = 186)
Geology, geophysics, astronomy, astrophysics, chemistry, physics, engineering science



Intellectual-Social-Realistic (INT-SOC-REAL)
(N = 239)
Mathematics education, natural science education, biology, other biological fields



Intellectual-Social-Artistic (INT-SOC-ART)
(N = 261)
Medicine, other health fields

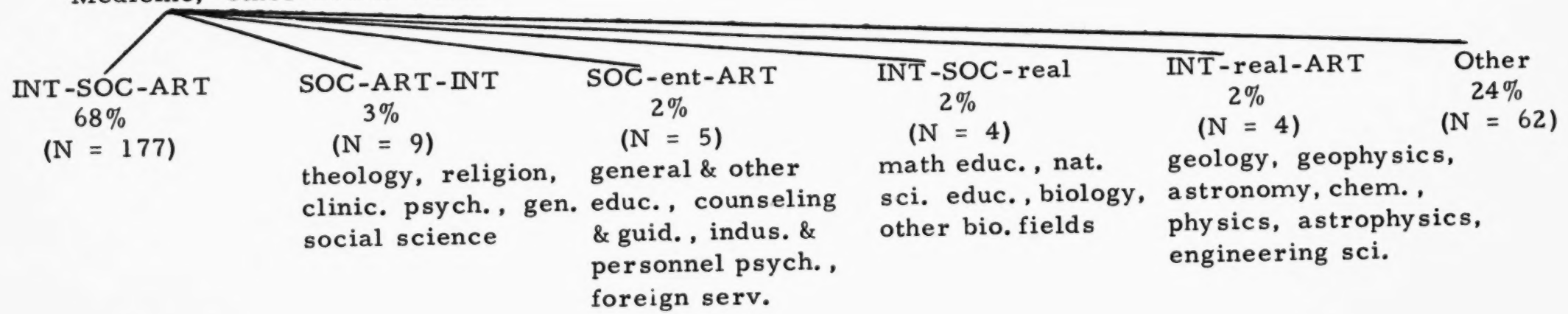


Figure 1 con't.

Conventional-Enterprising-Realistic (CON-ENT-REAL)
(N = 134)

Accounting

CON-ENT-REAL	ENT-CON-soc	CON-ENT-int	ENT-art-soc	Other
54%	13%	4%	3%	25%
(N = 73)	(N = 18)	(N = 6)	(N = 4)	(N = 33)
	management, marketing	finance	law	

Enterprising-Artistic-Social (ENT-ART-SOC)
(N = 168)

Law

ENT-ART-SOC	ENT-SOC-ART	ENT-con-SOC	SOC-ENT-int	int-real-ENT	Other
65%	4%	4%	3%	3%	21%
(N = 109)	(N = 7)	(N = 6)	(N = 5)	(N = 5)	(N = 36)
	polit. science	management, marketing	history, history educ., ed. psych.	aeronautical, chem., elec., gen. &other engineer. military serv.	

Artistic-Social-Intellectual (ART-SOC-INT)
(N = 95)

Speech, general humanities, philosophy, English, creative writing, art education, music education

ART-SOC-INT	ART-SOC-ent	ART-ent-SOC	SOC-ART-INT	SOC-real-INT	Other
46%	18%	4%	3%	3%	25%
(N = 44)	(N = 17)	(N = 4)	(N = 3)	(N = 3)	(N = 24)
	music, drama, Eng. education	journalism, radio TV, communications	theology, religion, clinic. psych., gen. social sciences	phys. educ., health & rec., educ. of except. children	

Social-Artistic-Enterprising (SOC-ART-ENT)
(N = 2357)
Speech, elementary & secondary education, counseling & guidance, sociology, history, public relations, advertising, law, home economics, housewife, social work

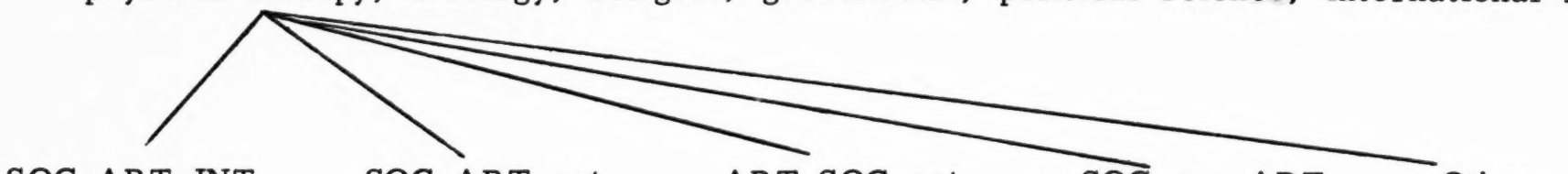
SOC-ART-ENT	ART-SOC-ENT	SOC-ART-int	SOC-ENT-ART	Other
86%	2%	2%	1%	8%
(N = 2036)	(N = 54)	(N = 41)	(N = 33)	(N = 193)
	drama, for. serv., music ed., mod. foreign lang., other fine &appl. arts, journalism, radio-TV, communications	dentistry, nurs., other health, clinical, exp. &gen. psych., phys. ther., theology, religion, poli. sci., govern., international relations	management, sales, purchasing, bus. admin., educ. psych.	

Social-Intellectual-Artistic (SOC-INT-ART)
(N = 227)
Pharmacy, medical technology, mathematics education

SOC-INT-ART	SOC-ART-ent	INT-SOC-ART	INT-SOC-con	Other
53%	22%	8%	4%	12%
(N = 121)	(N = 50)	(N = 18)	(N = 10)	(N = 28)
	home econ., hswf., speech, law, sociology, history, coun. &guid., advertising, public relations, social work, elem. & secondary educ.	medicine, vet. med., biochem., biology, chem., zoology, other bio. sci., nat. sci. educ.	mathematics, statistics	

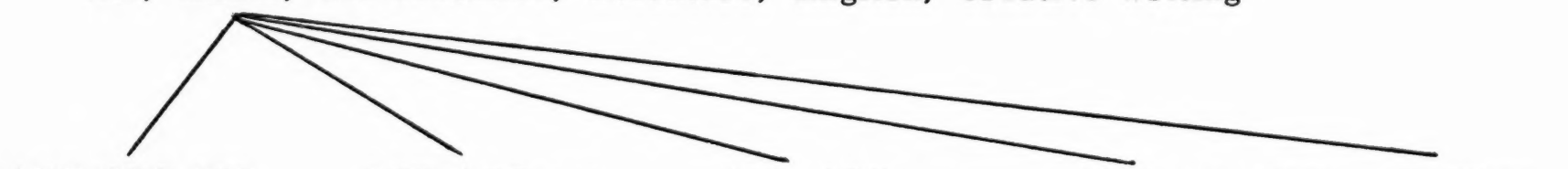
Figure 2 con't.

Social-Artistic-Intellectual (SOC-ART-INT)
(N = 386)
Dentistry, nursing, other health fields, clinical, general, & experimental psychology, physical therapy, theology, religion, government, political science, international relations



SOC-ART-INT	SOC-ART-ent	ART-SOC-ent	SOC-con-ART	Other
67%	19%	4%	2%	9%
(N = 258)	(N = 73)	(N = 14)	(N = 8)	(N = 33)
	home econ., hswf., speech, law, sociology, history, coun. &guid., advertising, public relations, soc. work, elem. &sec. education	drama, for. serv., music ed., mod. foreign lang., oth. fine&appl. arts, journalism, radio-TV, communications	secretarial science	

Artistic-Social-Intellectual (ART-SOC-INT)
(N = 191)
Art, music, art education, literature, English, creative writing



ART-SOC-INT	SOC-ART-ent	ART-SOC-ent	SOC-con-ART	Other
56%	16%	12%	2%	15%
(N = 107)	(N = 30)	(N = 22)	(N = 3)	(N = 29)
	home econ., hswf., speech, law, sociology, history, coun. &guid., advertising, public relations, soc. work, elem. &sec. education	drama, for. serv., music ed., mod. foreign lang., oth. fine & appl. arts, journalism, radio-TV, communications	secretarial science	

Figure 2 con't.

Intellectual-Social-Artistic (INT-SOC-ART)
(N = 236)
Medicine, veterinary medicine, biology, biochemistry, zoology, other biological sciences, chemistry, natural science education

INT-SOC-ART	SOC-ART-ent	SOC-ART-INT	SOC-INT-ART	Other
46%	22%	10%	6%	16%
(N = 109)	(N = 52)	(N = 24)	(N = 14)	(N = 37)
	home econ., hswf., speech, law, sociology, history, coun. &guid., advertising, public relations, soc. work, elem. & sec. education	dentistry, nurs., oth. health, clinical, exp. &gen. psych., phys. ther., theology, religion, poli. sci., govern., internat. relations	pharmacy, med. technology, math. education	

Social-Conventional-Artistic (SOC-CON-ART)
(N = 123)
Secretarial science

SOC-CON-ART	SOC-CON-ent	SOC-ART-ent	SOC-ART-int	Other
64%	15%	9%	2%	11%
(N = 79)	(N = 18)	(N = 11)	(N = 2)	(N = 13)
	clerical work, office work, business education	home econ., hswf., speech, law, sociology, history, coun. &guid., advertising, public relations, soc. work, elem. &sec. education	dentistry, nurs., oth. health, clinical, exp. &gen. psych., phys. ther., theology, religion, poli. sci., govern., internat. relations	

Figure 2 con't.

Artistic-Social-Enterprising (ART-SOC-ENT)
(N = 205)
Music education, drama, other fine & applied arts, modern foreign language, journalism, radio-TV, communications, foreign service

ART-SOC-ENT	SOC-ART-ENT	ART-SOC-int	SOC-ART-int	Other
52%	23%	6%	3%	16%
(N = 107)	(N = 47)	(N = 13)	(N = 6)	(N = 32)
	home econ., hswf., speech, law, sociology, history, coun. &guid., advertising, public relations, soc. work, elem. & sec. education	art, art education, music, literature, English, creative writing	dentistry, nurs., oth. health, clinical, exp. &gen. psych., phys. ther., theology, religion, poli. sci., govern., internat. relations	

Postscript

After this article was completed, two additional questions arose: (a) If Roe's occupational classification, a comparable classification, were applied to the same data, how well would her scheme order the data? And, (b) if the Holland and Roe classifications were applied only to students who changed their occupational choice, would these classifications still predict the changes beyond chance expectancy? Because 50% of the men and 60% of the women did not change their occupational choice, a high percentage of accuracy can be obtained without the use of any classification scheme by simply using the initial choice as the predicted choice.

Roe's Classification

The application of Roe's system to the data reported earlier produced Tables A and B for men and women.

To compare the relative efficiency of the Holland and Roe schemes, Tables C and D were prepared for men and women. These tables show how many students gave the same occupational choice on both occasions (SO), how many students gave different choices belonging to the same major occupational class (R), and how many students gave choices belonging to related major classes (r). (By Roe's definition related classes are the two adjacent classes so that III and V are related to IV; II and VIII are related to I, etc.) Unrelated vocational choices are all other possibilities except being undecided upon follow-up. The summary percentages at the bottom of Tables C and D make it clear that the Roe scheme orders the data with approximately

the same degree of efficiency as the Holland scheme (compare Tables C and D with Tables 6 and 7).

Changers Only

The application of the Holland and Roe classifications to only those students who changed their vocational choices was accomplished in the following way. For both classifications and for every initial vocational choice the following computations were performed: the number of students who changed their occupational choice, the number of possible related occupational choices for students with a given initial choice in each major class (k - 1), the expected percentage of related choices (the possible number of same-class related choices divided by the total number of choices in the classification scheme), the actual number of students making same-class related choices, the percentage of students whose second choice was related to their first choice (actual related N over change N), the number of occupations in the related occupational class, the expected percentage of students with related choices (the number of occupations in the related class divided by the number of possible choices in the entire classification), the number of students making related occupational choices in the related occupational class (or classes in the case of the Roe scheme), the percentage of students with different class related choices, and the total expected and actual frequencies for the same and related class. Table E illustrates these computations for a single class in Holland's scheme. Separate tables for both sexes and both classifications were prepared but are not presented because of their great size.

When the sign test was applied to these four complete tables for men and women using both classifications, they revealed that both classifications organize the data for changers well beyond a chance level; that is, the actual percentages usually exceed the expected percentages. More specifically, the obtained percentages exceed the expected percentages for the "Same Major Class" well beyond the .005 level for both classifications. The result holds for the total expected and total obtained frequencies, but the results for "related major class" are not significant for either classification system, although these insignificant results contribute positively, in the case of Holland's classification, to the total obtained frequency. Table F provides a simple statement of the relative efficiency of the two classifications when applied to changers. In this instance, Table F suggests that Holland's scheme is a more efficient predictive scheme than Roe's.

We conclude then, that for prediction purposes, either scheme is better than no classification. Holland's appears more efficient, subject to one qualification. Since Holland's scheme was developed for the present sample of college students, it may enjoy some advantage. Only many comparative tests of these systems with different populations for several purposes will make their usefulness and relative values explicit.

Table A

The Relation of a College Students' First Vocational Choice to His Vocational Choice 8-12 Months Later Using Roe's Classification Scheme

(Men)

	Second Vocational Choice									
1st VC	I	II	III	IV	V	VI	VII	VIII	Undecided	Total
I	119	1	11	6	2	13	26	1	12	191
II	0	10	18	2	0	1	3	1	6	41
III	7	31	297	3	1	11	46	3	48	447
IV	16	2	33	456	8	45	34	10	50	654
V	0	0	3	1	50	13	5	0	9	81
VI	30	5	56	21	22	616	85	13	94	942
VII	56	11	49	15	3	45	664	16	112	971
VIII	4	4	2	6	0	9	25	111	13	174
Undecided	13	11	53	19	5	42	73	11	143	370
Total	245	75	522	529	91	795	961	166	487	3871

Table B

The Relation of a College Students' First Vocational Choice to His Vocational Choice 8-12 Months Later Using Roe's Classification Scheme

(Women)

	Second Vocational Choice									
1st VC	I	II	III	IV	V	VI	VII	VIII	Undecided	Total
I	271	1	11	1	0	34	85	12	27	442
II	1	8	6	0	0	2	2	1	3	23
III	9	7	163	0	0	10	40	2	16	247
IV	2	0	1	4	0	0	1	3	3	14
V	0	0	1	0	0	0	1	0	0	2
VI	74	2	34	5	1	535	150	13	51	865
VII	116	11	33	3	0	81	1866	30	121	2261
VIII	14	1	7	0	0	6	53	161	30	272
Undecided	29	2	19	1	0	39	98	13	88	289
Total	516	32	275	14	1	707	2296	235	339	4415

Table C

Lawfulness of a College Student's Successive Vocational Choices

Using Roe's Classification Scheme

(Men)

	Second Vocational Choice					
Initial VC	SO	R	r	Unrelated	Undecided	N
I	110	9	2	58	12	191
II	10	0	18	7	6	41
III	191	106	34	68	48	447
IV	333	123	41	107	50	654
V	50	0	14	8	9	81
VI	472	144	107	125	94	942
VII	457	207	61	134	112	971
VIII	87	24	29	21	13	174
Total N	1710	613	306	528	344	3501
Percent N	49	18	09	15	10	100

Note. Total N is less those who started as "Undecided" N = 370.

Table D

Lawfulness of a College Student's Successive Vocational Choices

Using Roe's Classification Scheme

(Women)

	Second Vocational Choice					
Initial VC	SO	R	r	Unrelated	Undecided	N
I	247	24	13	131	27	442
II	6	2	7	5	3	23
III	121	42	7	61	16	247
IV	4	0	1	6	3	14
V	0	0	0	2	0	2
VI	428	107	151	128	51	865
VII	1483	383	111	163	121	2261
VII	121	40	67	14	30	272
Total N	2410	598	357	510	251	4126
Percent N	58	14	09	12	06	100

Note. Total N is less those who started as "Undecided" N = 289.

Table E

The Prediction of Change from Holland's Classification
for Students Who Changed Their Vocational Choice Over a 8-12 Month Interval
(Men)

Realistic vocations	Total N	Total N less unclass	Change N	Same class				Related class				Total	
				No. of related occup. k-1	Expected % related	Actual related N	Actual related %	No. of related occup. k	Expected % related	Actual related N	Actual related %	Expected %	Actual %
Industrial arts education	32	29	10	9	11.1	7	70.0	29	35.8	1	10.0	46.9	80.0
Trade & industrial ed	13	12	6	9	11.1	4	66.7	29	35.8	0	0.0	46.9	66.7
Forestry	55	49	16	9	11.1	2	12.5	29	35.8	7	43.8	46.9	56.3
Civil eng	124	114	47	9	11.1	23	48.9	29	35.8	13	27.6	46.9	76.5
Farming	26	23	6	9	11.1	5	83.3	29	35.8	1	16.7	46.9	100.0
Mech eng	121	109	43	9	11.1	6	14.0	29	35.8	22	51.2	46.9	65.2
Indus eng	22	20	9	9	11.1	2	22.2	29	35.8	3	33.3	46.9	55.5
Architecture	38	36	14	9	11.1	6	42.8	29	35.8	5	35.0	46.9	77.8
Geography	4	2	2	9	11.1	0	0.0	29	35.8	1	50.0	46.9	50.0
Agric sci	61	53	24	9	11.1	12	50.0	10	12.3	5	20.8	23.4	70.8

Note. k is the number of occupations in a major class. The number of related occupations (and, hence, the expected % related) for "Same class" is identical for all occupations within a major class. Since the "Related class" for each occupation is determined by the second highest VPI code, the number of different class related occupations (and resulting expected % related) differs for occupations within the same major class. Architecture (RIA) and Agriculture science (REI) illustrate this difference.

Table F

The Average Gain Beyond Chance for the

Holland and Roe Classification Systems

("Same" Plus "Related" Classes)

	Holland %	Roe %
Men	29.6	13.8
Women	21.3	10.8

ACT Research Reports

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